



Product Data

48HX Dual Fuel Heat Pump Units

2½ to 5 Nominal Tons



Quality Assurance



Certificate No FM 22838

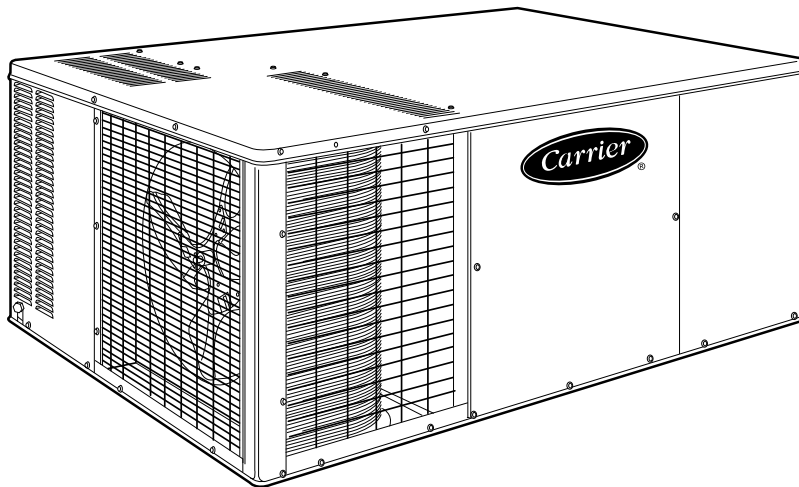
Approvals:

ISO 9002

EN 29002

BS5750 PART 2

ANSI/ASQC Q92



Dual Fuel Heat Pump for Manufactured Housing/Residential and Light Commercial Use. Features:

- direct spark ignition
- scroll compressors
- low sound levels
- 81% AFUE
- up to 12.0 SEER

Features/Benefits

One-piece electric heat pump with gas-fired back-up heat offers high efficiency, low installation and operating costs, dependable operation, and easy maintenance.

Easy installation

Factory-assembled package is a compact, fully self-contained, dual fuel heat pump. Unit is prewired, prepiped, and precharged for minimum installation expense.

The 48HX units are available in a variety of standard and optional heating/cooling size combinations with voltage options to meet residential and light commercial requirements. Unit installs easily on a rooftop or a ground-level pad. The optional base rail provides an elevated base.

Convertible duct configuration provides for easy use in either downflow or horizontal applications.

Low and high voltage electrical entries allow low and high voltage to be brought in through the front duct panel.

Efficient operation

High-efficiency design with SEERs (Seasonal Energy Efficiency Ratios) up to 12.0 and AFUE (Annual Fuel Utilization Efficiency) ratings as high as 81%. All units have a minimum CSE (California Seasonal Efficiency) rating of 76.5%.

Energy-saving, direct-spark ignition saves gas by operating only when the room thermostat calls for emergency heating or when low outdoor temperatures require more heat. Standard units are furnished with natural gas controls. A low-cost, field installed kit for propane conversion is available for all units.

48HX units meet California's maximum oxides of nitrogen (NO_x) emission requirements.

Compressors are designed for high efficiency. Each compressor is hermetically sealed against contamination to help promote longer life and dependable operation. Vibration isolation provides quiet operation. All compressors have internal high-pressure and overcurrent protection. Scroll compressors are standard on all units.

Monoport, inshot burners produce precise air-to-gas mixture which provides for lean and efficient combustion. The large monoport on the inshot (or injection type) burners seldom, if ever, needs cleaning. All gas furnace components are accessible in one compartment.

Turbo-tubular™ heat exchangers are constructed of aluminized steel for corrosion resistance and optimum heat transfer for improved efficiency. The tubular design permits hot gases to make multiple passes across the path of the supply air. In addition, dimples, located on the heat exchanger walls, force the hot gases to stay in close contact with the wall, improving heat transfer.

Direct-drive multispeed, PSC (permanent split capacitor) blower motor is standard for unit sizes 030 and 036. Variable-speed integrated control motor is standard for unit sizes 048 and 060, ensuring quieter operation.

Direct-drive PSC outdoor-fan motors are designed to help reduce energy consumption. A fixed metering device controls refrigerant flow and provides for cooling operation down to 40 F outdoor temperature.

Indoor and outdoor coils are computer-designed for optimum heat transfer and cooling efficiency.

Chronotemp™ defrost system provides time/temperature-based defrost cycles to maintain unit efficiency. This highly reliable system checks for coil icing conditions at preset time intervals and initiates a defrost cycle only if required. The defrost cycle ends as soon as defrosting is accomplished.

Durable, dependable components

Copper fin coils are also available from the factory by special order. These coils are recommended in applications

where aluminum fins are likely to be damaged due to corrosion and are ideal for seacoast applications.

Indoor and outdoor coils are located inside the unit to protect against damage and ensure long life and reliable operation. The outdoor coil is protected by a rubber-coated metal grille.

Solid-state Time Guard® circuit protects the compressor by preventing potentially damaging too-rapid cycling. Time Guard circuit is standard on all units.

Low sound ratings ensure a quiet indoor and outdoor environment with sound ratings as low as 7.8 bels.

Easy to service cabinets provide accessibility to serviceable components during maintenance and installation. Rounded corners are an important safety feature. A high quality finish ensures an attractive appearance.

Downflow option unit is converted for downflow at factory to allow vertical ductwork connections. Unit is equipped with base rail.

Optional base rails provide holes for rigging and handling, as well as an elevated mounting frame that gives structural support to horizontal installations.

Loss-of-charge switch shuts down refrigeration portion of unit. When the unit loses charge, the loss-of-charge switch protects the compressor from low-charge operation.

Refrigerant system is designed to provide dependability. Liquid refrigerant strainers are used to promote clean, unrestricted operation. Each unit leaves the factory with a full refrigerant charge. Refrigerant service connections make checking operating pressures easier.

Integrated gas control board provides safe and efficient control of heating and simplifies troubleshooting through its built-in diagnostic function.

Weatherized cabinets are constructed of heavy-duty, phosphated, zinc-coated prepainted steel capable of withstanding 500 hours in salt spray. Interior surfaces of the indoor/heat exchanger compartment are covered with foil-faced insulation to help keep the conditioned air from being affected by the outdoor ambient temperature and to provide improved air quality. Unit conforms to American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE) Standard 62P. Sloped condensate pan permits an external drain.

UNIT WITH OPTIONAL BASE RAIL

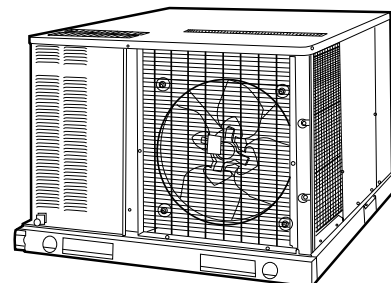
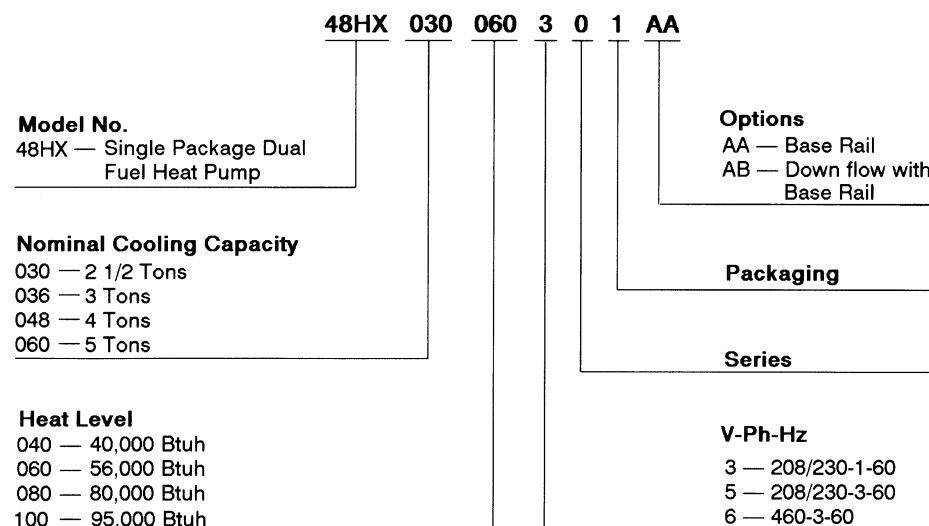


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Model number nomenclature



ARI* capacities

COOLING AND HEAT PUMP HEATING CAPACITIES AND EFFICIENCIES

UNIT 48HX	NOMINAL TONS	STANDARD CFM	NET COOLING† CAPACITIES AT 95 F (Btuh)	SEER†	NET HEATING† CAPACITIES AT 47 F (Btuh)	COP† At 47 F (Btuh)	NET HEATING† CAPACITIES At 17 F (Btuh)	COP† At 17 F (Btuh)	HSPF	SOUND RATINGS** (Bels)
030	2½	1000	28,600	12.0	28,200	3.2	15,400	1.9	7.1	7.8
036	3	1200	35,000	12.0	34,400	3.4	18,000	1.9	7.1	8.0
048	4	1600	47,500	12.0	44,000	3.5	23,600	2.0	7.0	8.2
060	5	1800	57,000	11.0	57,000	3.5	31,800	2.0	7.2	8.2

LEGEND

Bels — Sound Levels (1 bel = 10 decibels)
COP — Coefficient of Performance
DOE — Department of Energy
HSPF — Heating Seasonal Performance Factor
SEER — Seasonal Energy Efficiency Ratio

*Air Conditioning & Refrigeration Institute.

†Rated in accordance with ARI Standard 210/240-89 and/or U.S. Government DOE test procedures.

**Rated in accordance with ARI Standard 270-84.



GAS HEATING CAPACITIES AND EFFICIENCIES

UNIT 48HX	HEATING INPUT (Btuh)	OUTPUT CAPACITY (Btuh)	TEMPERATURE RISE RANGE (F)	AFUE (%)	CSE (%)
030040	40,000	32,800	20-50	81	76.5
030060 036060	56,000	45,400	25-55	81	77.5
036080 048080 060080	80,000	64,800	40-70	81	77.5
048100 060100	95,000	77,000	50-80	81	78.0

LEGEND

AFUE — Annual Fuel Utilization Efficiency
CSE — California Seasonal Efficiency

NOTE: Before purchasing this appliance, read important energy cost and efficiency information available from your retailer.

OUTDOOR SOUND: ONE-THIRD OCTAVE BAND DATA — DECIBELS

FREQUENCY (Hz)	SOUND POWER LEVEL FOR 48HX UNIT			
	030	036	048	060
63	48.7	49.1	56.0	54.3
125	61.9	65.5	65.6	65.1
250	76.5	71.6	71.5	71.5
500	69.7	71.6	71.4	72.7
1000	72.1	71.7	74.2	73.9
2000	69.2	70.0	73.3	73.4
4000	64.3	68.7	69.6	71.7
8000	57.2	63.7	67.1	66.3

Physical data



UNIT SIZE 48HX	030040	030060	036060	036080	048080	048100	060080	060100
NOMINAL CAPACITY (tons)	2½	2½	3	3	4	4	5	5
OPERATING WEIGHT (lb) Without Base Rail With Optional Base Rail	346 370	358 382	376 400	376 400	432 456	432 456	463 487	463 487
COMPRESSOR Quantity	Scroll 1							
REFRIGERANT Charge (lb)	R-22 5.6 5.6 6.0 6.0 7.8 7.8 8.5 8.5							
OUTDOOR COIL Rows...Fins/in. Face Area (sq ft)	2...17 7.0	2...17 7.0	2...17 7.0	2...17 7.0	2...17 8.66	2...17 8.66	2...17 8.66	2...17 8.66
OUTDOOR FAN (Propeller) Nominal Cfm Diameter (in.) Motor Hp Motor Rpm	2200 20 ¼ 1100	2200 20 ¼ 1100	2200 20 ¼ 1100	2200 20 ¼ 1100	2400 20 ⅓ 1100	2400 20 ⅓ 1100	2400 20 ⅓ 1100	2400 20 ⅓ 1100
INDOOR COIL Rows...Fins/in. Face Area (sq ft)	3...15 3.6	3...15 3.6	4...15 3.6	4...15 3.6	4...15 4.5	4...15 4.5	4...15 4.5	4...15 4.5
INDOOR FAN (Centrifugal)* Nominal Airflow (Cfm) Size (in.) Motor Hp Motor Rpm	1000 10 x 10 ¼ 1075	1000 10 x 10 ¼ 1075	1300 10 x 10 ¼ 1100	1300 10 x 10 ½ 1100	1600 10 x 10 1 Variable	1600 10 x 10 1 Variable	1800 10 x 10 1 Variable	1800 10 x 10 1 Variable
FURNACE SECTION Heating Input† (Btuh) Burner Orifice (Qty...drill size) Natural Gas Propane Gas	40,000 1...32 1...41	56,000 2...41 2...46	56,000 2...41 2...46	80,000 2...32 2...42	80,000 2...32 2...42	95,000 2...30 2...41	80,000 2...32 2...42	95,000 2...30 2...41
RETURN-AIR FILTERS** Throwaway (in.)	24 x 24	24 x 24	24 x 24	24 x 24	24 x 30	24 x 30	24 x 30	24 x 30

*Sizes 048 and 060 indoor fans are equipped with an integrated control motor (ICM). The ICM provides variable speed.

†Based on an altitude of 0 to 2000 feet.

**Required filter sizes shown are based on the ARI (Air Conditioning & Refrigeration Institute) rated heating airflow at a velocity of 300 ft/min for throwaway type or 450 ft/min for high capacity type. Recommended filters are 1-in. thick.

Options and accessories



Factory-installed options

Unit with base rail provides holes for rigging and handling as well as an elevated mounting frame that gives additional structural support for horizontal installations.

Downflow option unit is shipped from the factory configured for downflow (vertical) ductwork connection. Unit is equipped with base rail.

Field-installed accessories

ACCESSORY	
	8 in.
Flat Roof Curb	11 in.
	14 in.
Manual Outdoor-Air Damper	
Filter Rack	
Lifting Bracket Kit	
Thermostat and Subbase	
Loss of Charge Switch	
Low-Ambient Kit (Motormaster® II device)	
Natural Gas-to-Propane Conversion Kit	
Downshot-to-Sideshot Conversion Kit	

Factory-assembled roof curbs are designed for use on downflow discharge applications. Heavy gage, galvanized steel construction provides one-piece support. The curb complies with the standards of the NRCA (National Roofing Contractors Association). A wood nailing strip is provided for attaching the roofing to the curb.

Manual outdoor-air damper provides for minimum outdoor air and is manually adjustable.

Thermostat and subbase provides heating and cooling unit control. The subbase provides system and fan switching at the thermostat location.

Low-ambient kit (Motormaster® II device) allows the use of mechanical cooling down to outdoor ambient temperatures as low as 0° F.

Loss-of-charge switch provides additional safety features and protects the unit from running at unsuitable pressures.

Filter rack features easy installation, serviceability, and high filtering performance for downflow installation.

Lifting bracket kit provides attachment points for rigging straps. The kit is not required when the unit is equipped with an optional base rail or downflow application.

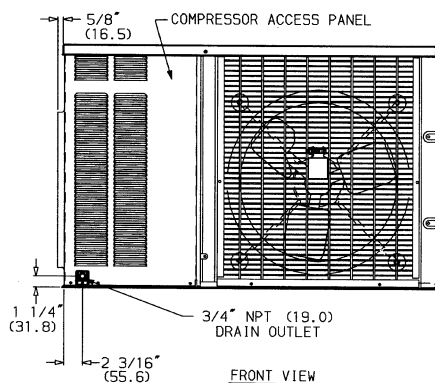
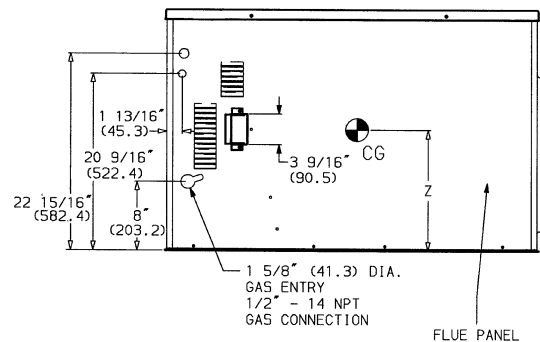
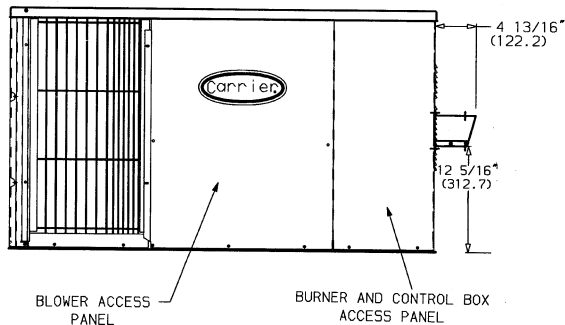
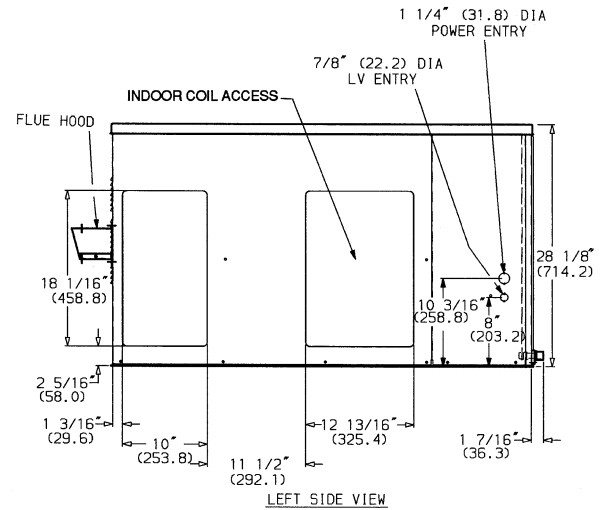
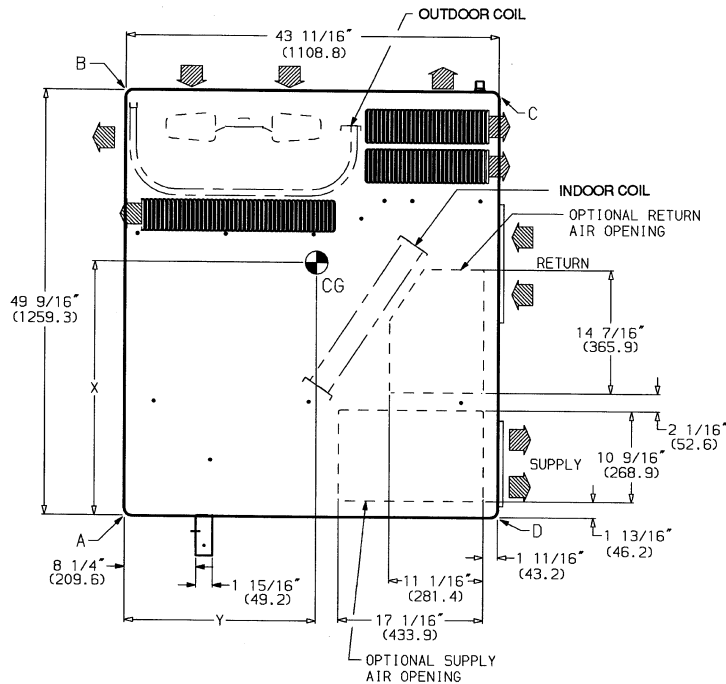
Downshot-to-sideshot conversion kit converts a dedicated downflow (vertical) discharge unit to a sideshot (horizontal) discharge unit.

Natural gas-to-propane conversion kit allows for conversion from natural gas to liquid propane.

Base unit dimensions — 48HX030 and 036



UNIT WITHOUT BASE RAIL



REQ'D CLEARANCES FOR SERVICING. in. (mm)

Duct panel	0
Unit top	36 (914.4)
Side opposite ducts	36 (914.4)
Compressor access	36 (914.4)
(Except for NEC requirements)	

REQ'D CLEARANCES TO COMBUSTIBLE MATL. in. (mm)

Maximum extension of overhangs	48 (1219.2)
Unit top	14 (355.6)
Duct side of unit	0
Side opposite ducts	9 (228.6)
Bottom of unit	0
Flue panel	30 (762.0)

NEC REQ'D CLEARANCES. in. (mm)

Between units, control box side	42 (1066.8)
Unit and ungrounded surfaces, control box side	36 (914.4)
Unit and block or concrete walls and other grounded surfaces, control box side	42 (1066.8)

UNIT	ELECTRICAL CHARACTERISTICS	UNIT WEIGHT		CORNER WEIGHT (lb/kg)			
		lb	kg	A	B	C	D
48HX030040	208-230-1-60, 208/230-3-60	346	157	99/45	69/31	120/55	58/26
48HX030060	208-230-1-60, 208/230-3-60	358	163	102/46	72/33	123/56	71/32
48HX036060 48HX036080	208-230-1-60, 208/230-3-60, 460-3-60	376	171	96/44	87/44	119/54	71/32

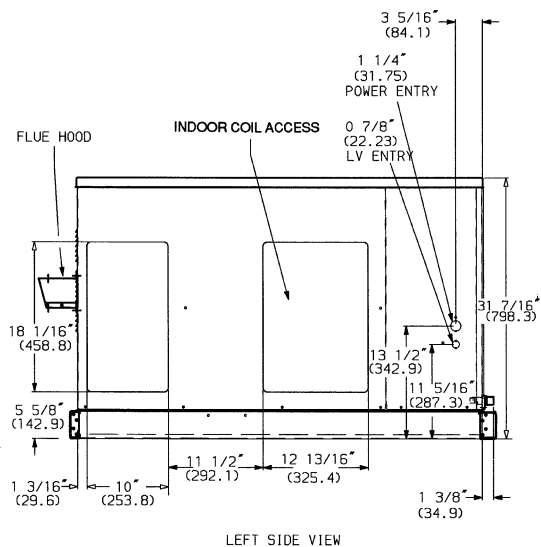
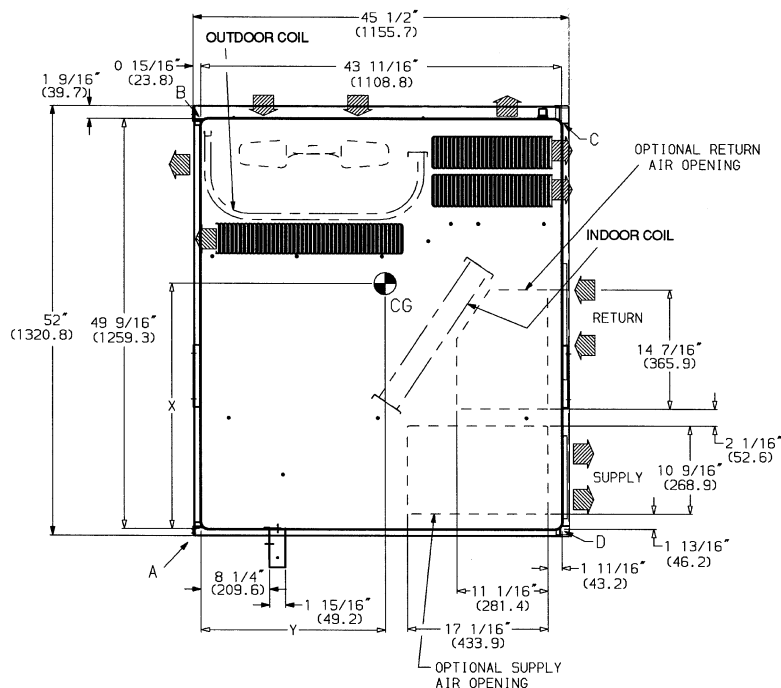
UNIT	CENTER OF GRAVITY (in./mm)		
	X	Y	Z
48HX030040	27.0/686	22.6/575	12.7/321
48HX030060	26.9/684	22.6/575	12.7/321
48HX036060 48HX036080	27.1/688	22.6/575	12.7/321

LEGEND

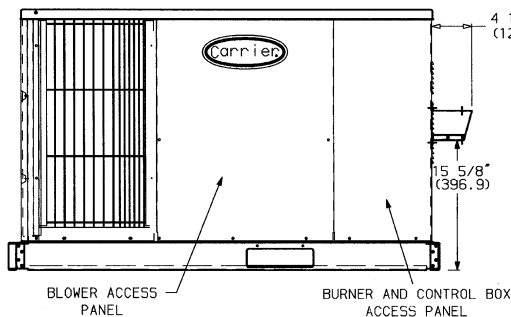
CG	— Center of Gravity	MAT'L	— Material
LV	— Low Voltage	NEC	— National Electrical Code
		REQ'D	— Required

NOTE: Clearances must be maintained to prevent recirculation of air from condenser-fan discharge.

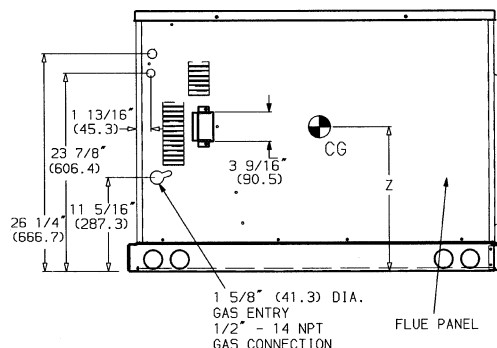
UNIT WITH OPTIONAL BASE RAIL



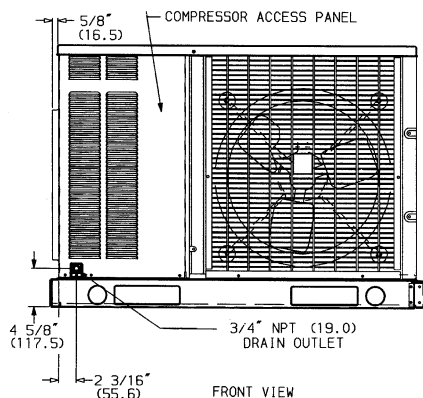
LEFT SIDE VIEW



RIGHT SIDE VIEW



REAR VIEW



FRONT VIEW

REQ'D CLEARANCES FOR SERVICING. in. (mm)

Duct panel	0
Unit top	36 (914.4)
Side opposite ducts	36 (914.4)
Compressor access (Except for NEC requirements)	36 (914.4)

REQ'D CLEARANCES TO COMBUSTIBLE MATL. in. (mm)

Maximum extension of overhangs	48 (1219.2)
Unit top	14 (355.6)
Duct side of unit	0
Side opposite ducts	9 (228.6)
Bottom of unit	0
Flue panel	30 (762.0)

NEC REQ'D CLEARANCES. in. (mm)

Between units, control box side	42 (1066.8)
Unit and ungrounded surfaces, control box side	36 (914.4)
Unit and block or concrete walls and other grounded surfaces, control box side	42 (1066.8)

UNIT	ELECTRICAL CHARACTERISTICS	UNIT WEIGHT		CORNER WEIGHT (lb/kg)			
		lb	kg	A	B	C	D
48HX030040	208/230-1-60, 208/230-3-60	370	169	105/48	75/34	126/57	64/29
48HX030060	208/230-1-60, 208/230-3-60	382	174	108/49	78/35	129/59	67/30
48HX036060 48HX036080	208-230-1-60, 208/230-3-60, 460-3-60	400	182	102/46	93/42	125/57	77/35

UNIT	CENTER OF GRAVITY (in./mm)		
	X	Y	Z
48HX030040	26.9/682	23.3/590	16.0/405
48HX030060	26.8/680	23.3/590	16.0/405
48HX036060 48HX036080	27.0/684	23.3/590	16.0/405

LEGEND

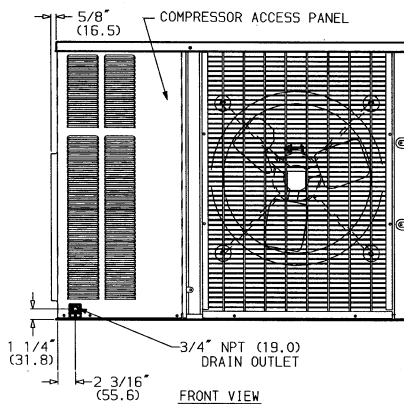
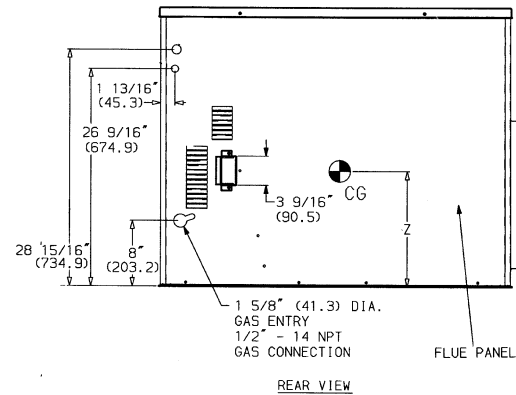
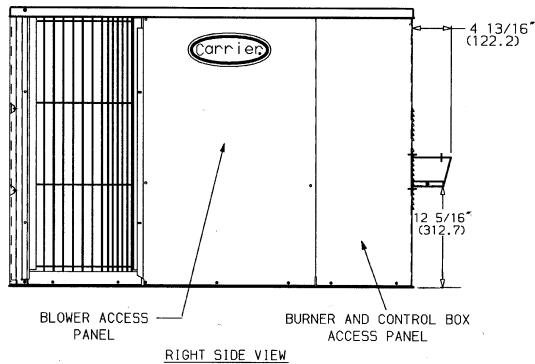
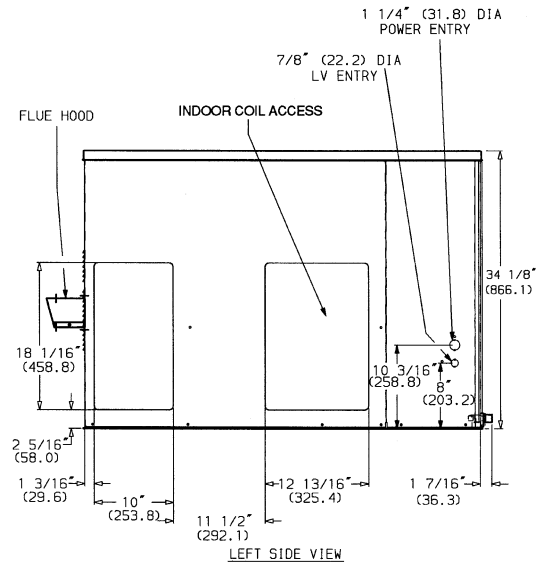
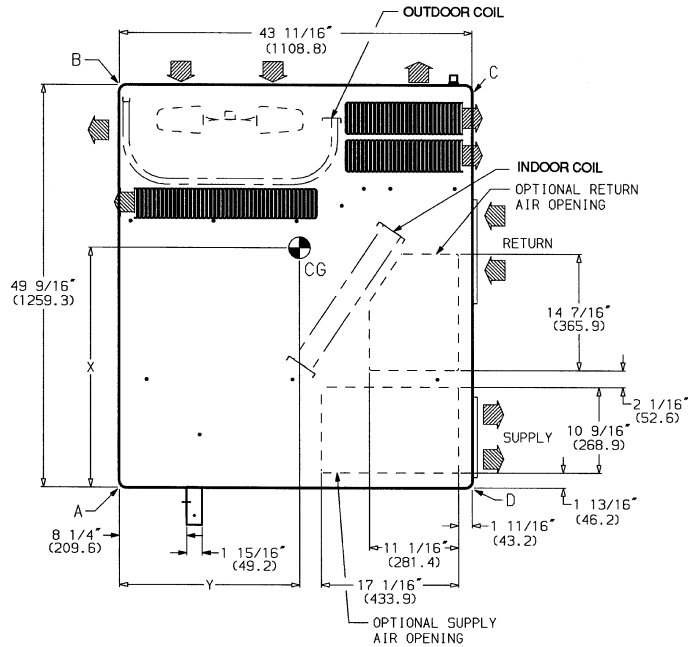
CG	Center of Gravity	MAT'L	Material
LV	Low Voltage	NEC	National Electrical Code
		REQ'D	Required

NOTE: Clearances must be maintained to prevent recirculation of air from condenser-fan discharge.

Base unit dimensions — 48HX048 and 060



UNIT WITHOUT BASE RAIL



REQ'D CLEARANCES FOR SERVICING. in. (mm)

Duct panel	0
Unit top	36 (914.4)
Side opposite ducts	36 (914.4)
Compressor access	36 (914.4)
(Except for NEC requirements)	

REQ'D CLEARANCES TO COMBUSTIBLE MATL. in. (mm)

Maximum extension of overhangs	48 (1219.2)
Unit top	14 (355.6)
Duct side of unit	0
Side opposite ducts	9 (228.6)
Bottom of unit	0
Flue panel	30 (762.0)

NEC REQ'D CLEARANCES. in. (mm)

Between units, control box side	42 (1066.8)
Unit and ungrounded surfaces, control box side	36 (914.4)
Unit and block or concrete walls and other grounded surfaces, control box side	42 (1066.8)

UNIT	ELECTRICAL CHARACTERISTICS	UNIT WEIGHT		CORNER WEIGHT (lb/kg)			
		lb	kg	A	B	C	D
48HX048080 48HX048100	208/230-1-60, 208/230-3-60	432	196	111/50	88/40	160/73	73/33
48HX060080 48HX060100	208/230-1-60, 208/230-3-60	463	210	119/54	96/44	167/76	81/37

UNIT	CENTER OF GRAVITY (in./mm)		
	X	Y	Z
48HX048080 48HX048100	28.4/720	23.8/604	15.4/390
48HX060080 48HX060100	28.1/713	23.6/599	15.4/390

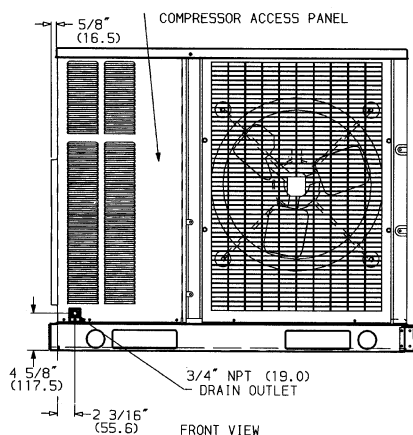
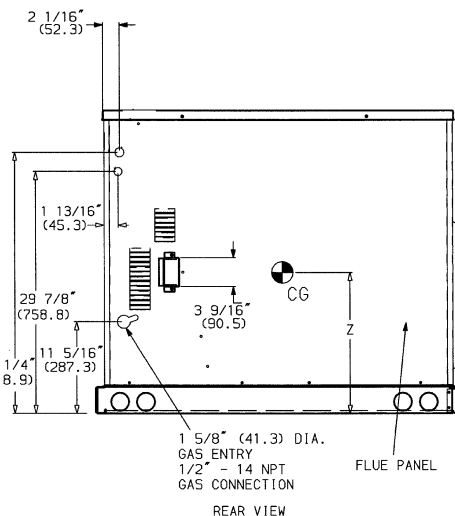
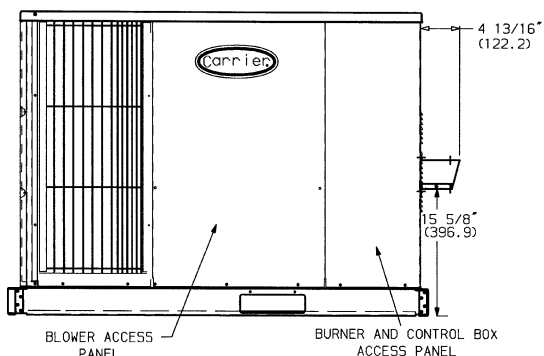
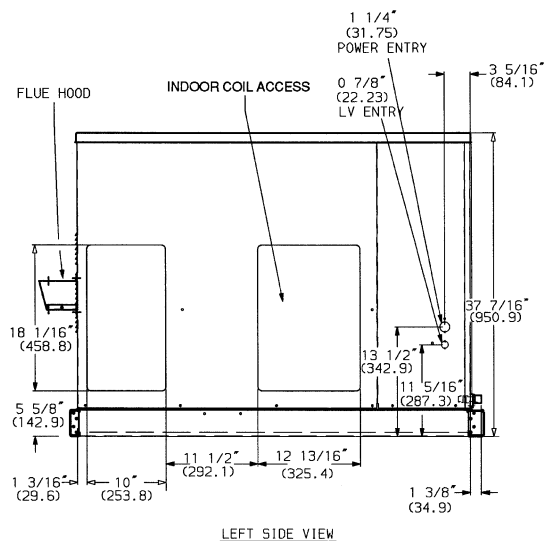
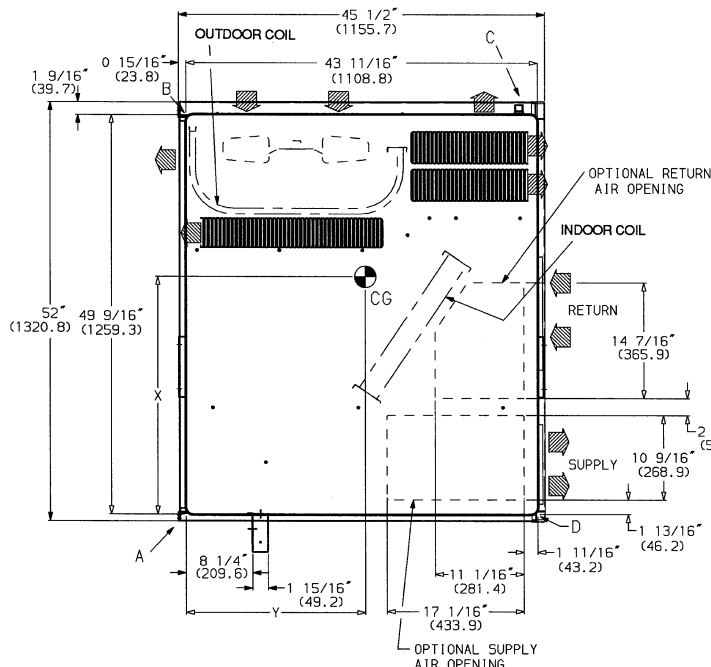
LEGEND

NOTE: Clearances must be maintained to prevent recirculation of air from condenser-fan discharge.

CG — Center of Gravity
LV — Low Voltage

MAT'L — Material
NEC — National Electrical Code
REQ'D — Required

UNIT WITH OPTIONAL BASE RAIL



REQ'D CLEARANCES FOR SERVICING. in. (mm)

Duct panel	0
Unit top	36 (914.4)
Side opposite ducts	36 (914.4)
Compressor access	36 (914.4)
(Except for NEC requirements)	

REQ'D CLEARANCES TO COMBUSTIBLE MATL. in. (mm)

Maximum extension of overhangs	48 (1219.2)
Unit top	14 (355.6)
Duct side of unit	0
Side opposite ducts	9 (228.6)
Bottom of unit	0
Flue panel	30 (762.0)

NEC REQ'D CLEARANCES. in. (mm)

Between units, control box side	42 (1066.8)
Unit and ungrounded surfaces, control box side	36 (914.4)
Unit and block or concrete walls and other grounded surfaces, control box side	42 (1066.8)

UNIT	ELECTRICAL CHARACTERISTICS	UNIT WEIGHT		CORNER WEIGHT (lb/kg)			
		lb	kg	A	B	C	D
48HX048080 48HX048100	208/230-1-60, 208/230-3-60	456	207	117/53	94/43	166/75	79/36
48HX060080 48HX060100	208/230-1-60, 208/230-3-60	487	221	125/57	102/46	173/79	87/40

UNIT	CENTER OF GRAVITY (in./mm)		
	X	Y	Z
48HX048080 48HX048100	28.2/716	24.5/622	18.7/474
48HX060080 48HX060100	27.9/709	24.3/618	18.7/474

LEGEND

CG	— Center of Gravity	MAT'L	— Material
LV	— Low Voltage	NEC	— National Electrical Code
		REQ'D	— Required

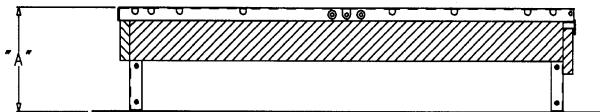
NOTE: Clearances must be maintained to prevent recirculation of air from condenser-fan discharge.

Accessory dimensions



ROOF CURB

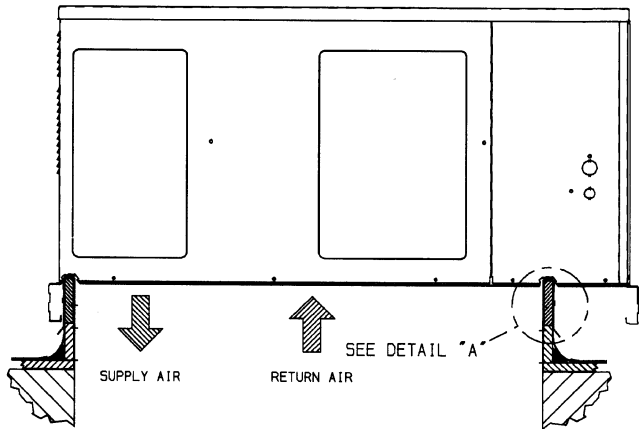
	PART NUMBER	"A"
FLAT	CPRFCURB001A00	8" [203]
	CPRFCURB002A00	11" [279]
	CPRFCURB003A00	14" [356]



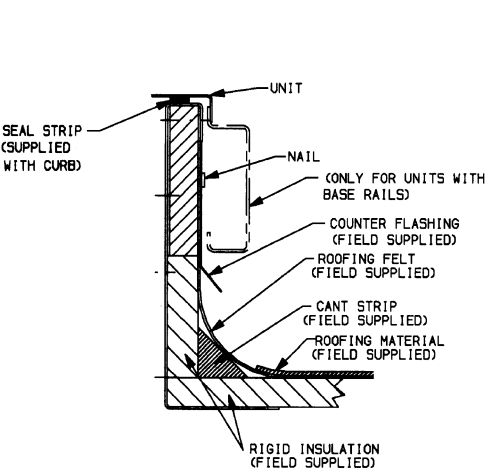
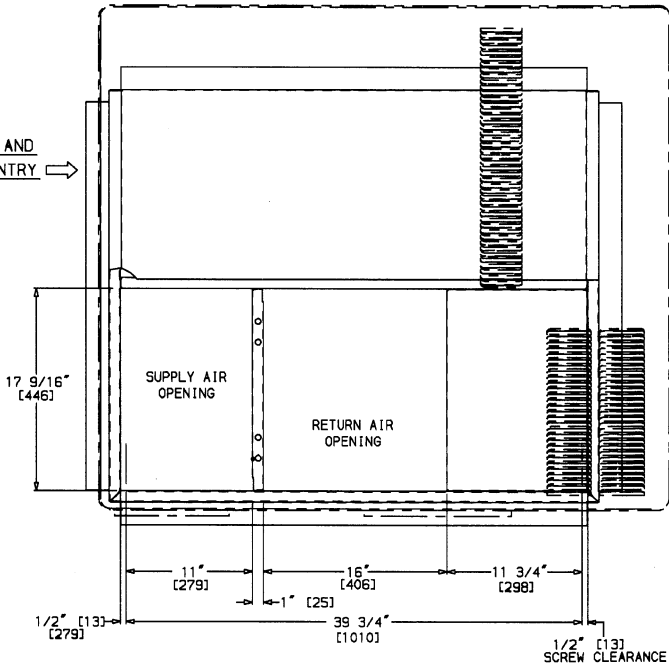
FLAT CURB

NOTES:

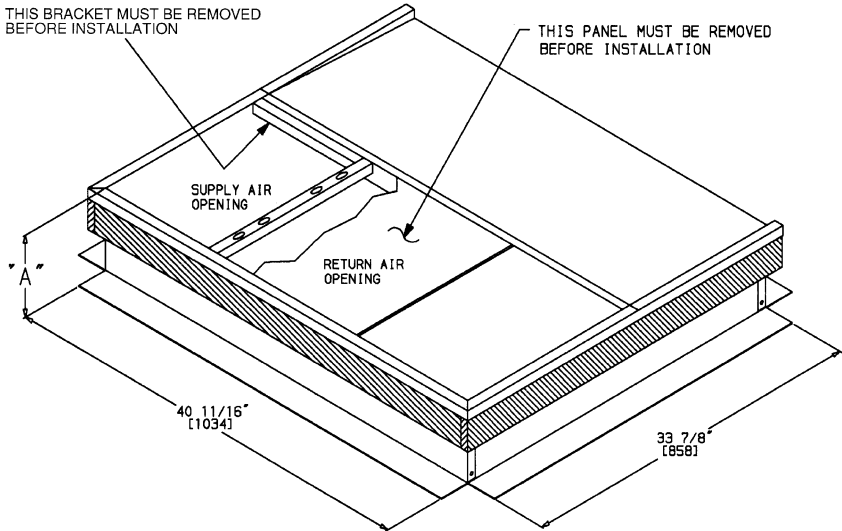
1. Roof curb must be set up for unit being installed.
2. Seal strip must be applied as required for unit being installed.
3. Dimensions in [] are in millimeters.
4. Roof curb is made of 16 gage steel.
5. Attach ductwork to curb (flanges of duct rest on curb).
6. Service clearance 4 ft on each side.
7. Direction of airflow.
8. Insulated panels: 1-in. thick fiberglass 1 lb density.

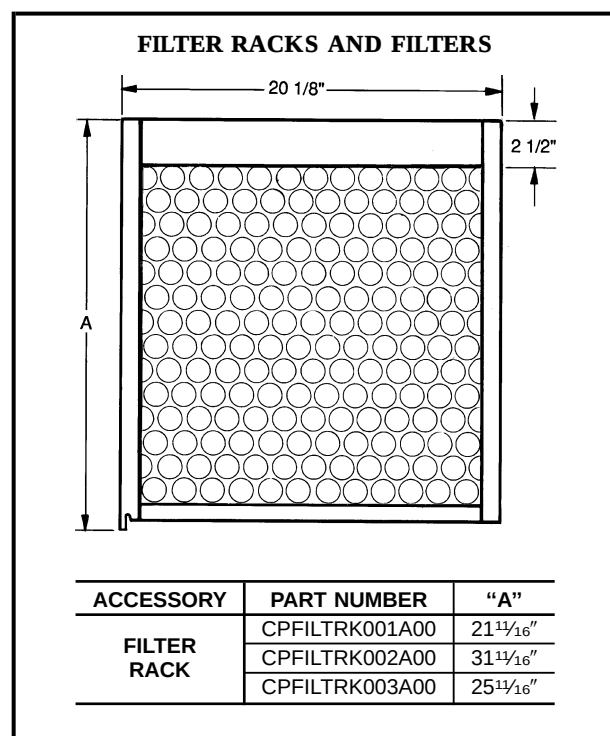
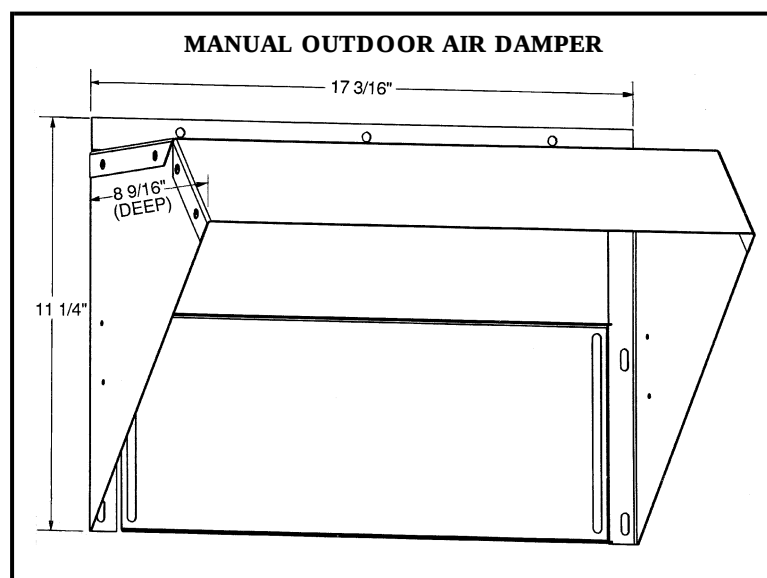


POWER AND
GAS ENTRY



DETAIL "A"





Selection procedure (with example)

I Determine cooling and heating requirements at design conditions:

Given:

Required Cooling Capacity (TC) 34,000 Btuh
 Sensible Heat Capacity (SHC) 24,000 Btuh
 Required Heating Capacity 60,000 Btuh
 Condenser Entering-Air Temperature 95 F
 Indoor-Air Temperature 80 F edb, 67 F ewb
 Evaporator-Air Quantity 1200 cfm
 External Static Pressure 0.3 in. wg
 Electrical Characteristics (V-Ph-Hz) 208-1-60

II Select unit based on required cooling capacity.

Enter Net Cooling Capacities table at condenser entering temperature of 95 F. Unit 48HX036 at 1200 cfm and 67 F ewb (entering wet bulb) will provide a total capacity of 35,000 Btuh and an SHC of 26,300 Btuh. Calculate SHC correction, if required, using Note 3 under Cooling Capacities tables.

III Select heating capacity of unit to provide design condition requirement.

In the Gas Heating Capacities and Efficiencies table on page 3, note that unit 48HX036080 will provide 64,800 Btuh with an input of 80,000 Btuh.

IV Determine fan speed and power requirements at design conditions.

Before entering the air delivery tables, calculate the total static pressure required. From the given, the Wet Coil Pressure Drop table, and the Filter Pressure Drop table on page 16, find at 1200 cfm:

External static pressure	0.3 in. wg
Wet coil	0.096 in. wg
Filter	0.09 in. wg
Total static pressure	0.486 in. wg

The Electrical Data table on page 18 shows that the unit is designed to operate at 208-1-60.

Enter the table for Dry Coil Air Delivery — Horizontal and Downflow Discharge for 230 and 460 V on page 15. For 208 v operation, deduct 10% from value given. The fan will deliver 1350 cfm at 0.5 ESP (external static pressure) at high speed and 1170 cfm at 0.5 ESP at medium speed. The fan speed should be set at medium for maximum cooling and heating efficiency.

Performance data



COOLING CAPACITIES

48HX030 (2½ TONS)													
Temp (F) Air Ent Cond		Indoor Air — Cfm/BF											
		875/0.04				1000/0.05				1125/0.06			
		Indoor Air — Ewb (F)											
		72	67	63*	62	72	67	63*	62	72	67	63*	62
85	TC	32.5	29.4	27.0	25.7	33.2	29.8	27.5	26.2	33.2	30.1	27.9	27.0
	SHC	15.4	19.9	19.3	23.8	16.2	21.1	20.5	25.5	16.6	22.3	21.7	27.0
	KW	2.61	2.58	2.56	2.55	2.67	2.63	2.62	2.61	2.72	2.68	2.66	2.66
95	TC	31.5	28.2	25.1	23.9	31.9	28.6	25.9	24.8	31.9	28.8	26.5	26.0
	SHC	15.2	19.5	18.5	22.9	15.8	20.7	19.9	24.6	16.2	21.9	21.2	26.0
	KW	2.85	2.81	2.78	2.77	2.90	2.86	2.83	2.83	2.94	2.91	2.89	2.89
105	TC	30.1	26.8	23.4	22.3	30.5	27.2	23.8	23.4	30.8	27.4	24.6	24.7
	SHC	14.7	19.0	17.8	22.1	15.3	20.3	19.1	23.4	16.1	21.4	20.5	24.7
	KW	3.09	3.06	3.02	3.01	3.14	3.11	3.07	3.07	3.20	3.16	3.13	3.13
115	TC	28.8	24.8	22.6	21.8	29.1	25.1	21.5	21.9	29.3	25.9	21.7	22.8
	SHC	14.3	18.3	17.4	21.7	15.0	19.6	18.1	21.9	15.6	21.0	19.3	22.8
	KW	3.37	3.32	3.27	3.27	3.42	3.38	3.33	3.34	3.47	3.44	3.38	3.41

48HX036 (3 TONS)													
Temp (F) Outdoor Ent Air		Indoor Air — Cfm/BF											
		1050/0.03				1200/0.04				1350/0.05			
		Indoor Air — Ewb (F)											
		72	67	63*	62	72	67	63*	62	72	67	63*	62
85	TC	39.7	36.2	33.5	32.6	40.4	36.7	34.1	33.3	40.7	37.1	34.5	34.1
	SHC	19.7	25.3	24.5	30.5	20.7	27.0	26.1	32.6	21.5	28.6	27.6	34.1
	KW	3.17	3.12	3.10	3.08	3.24	3.19	3.16	3.15	3.30	3.26	3.23	3.21
95	TC	38.1	34.5	31.9	31.1	38.7	35.0	32.4	31.8	39.1	35.4	32.7	32.7
	SHC	19.2	24.7	23.8	29.7	20.2	26.3	25.4	31.7	21.1	28.0	27.0	32.7
	KW	3.48	3.43	3.39	3.38	3.55	3.50	3.46	3.45	3.61	3.57	3.53	3.53
105	TC	36.3	32.7	30.0	29.2	36.8	33.1	30.5	30.3	37.2	33.5	30.9	31.3
	SHC	18.6	24.0	23.0	28.8	19.6	25.7	24.6	30.2	20.5	27.3	26.2	31.2
	KW	3.82	3.76	3.70	3.69	3.89	3.83	3.77	3.77	3.95	3.90	3.84	3.85
115	TC	34.2	30.4	27.7	27.3	34.7	30.9	28.2	28.5	35.0	31.3	28.5	29.4
	SHC	18.0	23.1	22.1	27.3	19.0	24.8	23.7	28.4	19.9	26.5	25.2	29.4
	KW	4.19	4.10	4.04	4.03	4.26	4.17	4.11	4.12	4.33	4.24	4.17	4.20

48HX048 (4 TONS)													
Temp (F) Outdoor Ent Air		Indoor Air — Cfm/BF											
		1400/0.05				1600/0.05				1800/0.06			
		Indoor Air — Ewb (F)											
		72	67	63*	62	72	67	63*	62	72	67	63*	62
85	TC	54.2	49.0	45.4	44.1	55.1	49.8	46.2	45.1	55.8	50.5	46.8	46.2
	SHC	26.9	34.3	33.3	41.4	28.3	36.6	35.5	44.2	29.7	38.8	37.7	46.1
	KW	4.25	4.18	4.14	4.13	4.31	4.24	4.20	4.19	4.38	4.31	4.26	4.26
95	TC	51.9	46.8	43.1	41.9	52.8	47.5	43.8	43.1	53.2	48.1	44.3	44.4
	SHC	26.2	33.5	32.4	40.3	27.6	35.8	34.6	43.0	28.9	38.1	36.7	44.4
	KW	4.71	4.64	4.60	4.58	4.78	4.70	4.66	4.64	4.83	4.77	4.72	4.71
105	TC	49.5	44.4	40.8	39.7	50.2	45.1	41.4	41.1	50.8	45.6	41.8	42.4
	SHC	25.4	32.7	31.4	39.2	26.8	35.0	33.6	41.1	28.1	37.3	35.7	42.4
	KW	5.21	5.13	5.09	5.07	5.27	5.19	5.15	5.15	5.34	5.26	5.22	5.23
115	TC	46.9	41.8	38.4	37.6	47.6	42.4	38.9	39.1	48.0	42.8	39.3	40.3
	SHC	24.7	31.7	30.4	37.6	26.0	34.0	32.6	39.1	27.3	36.2	34.6	40.3
	KW	5.77	5.67	5.60	5.59	5.84	5.74	5.67	5.68	5.90	5.80	5.74	5.77

LEGEND

BF	—	Bypass Factor
Edb	—	Entering Dry-Bulb
Ewb	—	Entering Wet-Bulb
kW	—	Total Unit Power Input
Ldb	—	Leaving Dry-Bulb
Lwb	—	Leaving Wet-Bulb
SHC	—	Sensible Heat Capacity (1000 Btuh) Net
TC	—	Total Capacity (1000 Btuh) Net

*At 75 F entering dry bulb (Tennessee Valley Authority [TVA] rating conditions); all others at 80 F entering dry bulb.

48HX060 (5 TONS)													
Temp (F) Outdoor Ent Air		Indoor Air — Cfm/BF											
		1800/0.03				2000/0.04				2250/0.04			
		Indoor Air — Ewb (F)											
		72	67	63*	62	72	67	63*	62	72	67	63*	62
85	TC	66.8	60.0	55.7	54.1	67.5	60.7	56.3	55.4	68.2	61.2	56.8	57.1
	SHC	34.3	44.2	42.6	53.3	35.8	46.7	45.0	55.4	37.7	49.7	47.8	57.1
	KW	5.94	5.71	5.56	5.53	6.04	5.80	5.65	5.64	6.14	5.91	5.75	5.78
95	TC	63.5	57.0	52.8	51.6	64.1	57.5	53.4	53.1	64.6	58.0	53.8	54.6
	SHC	33.2	43.0	41.5	51.6	34.7	45.5	43.8	53.1	36.5	48.4	46.5	54.6
	KW	6.50	6.27	6.10	6.08	6.60	6.35	6.19	6.20	6.70	6.46	6.29	6.34
105	TC	60.0	53.9	49.9	49.3	60.5	54.2	50.3	50.7	61.0	54.6	50.7	52.1
	SHC	32.1	41.8	40.3	49.3	33.5	44.2	42.5	50.7	35.3	47.2	45.3	52.1
	KW	7.13	6.88	6.70	6.70	7.22	6.96	6.79	6.83	7.33	7.07	6.89	6.97
115	TC	56.4	50.6	46.9	47.1	57.0	51.0	47.3	48.2	57.3	51.3	47.6	49.5
	SHC	30.9	40.6	39.2	47.0	32.4	43.0	41.3	48.2	34.2	46.0	44.0	49.5
	KW	7.79	7.52	7.33	7.37	7.89	7.62	7.42	7.50	8.00	7.72	7.53	7.64

NOTES:

1. Direct interpolation is permissible. Do not extrapolate.
2. The following formulas may be used:

$$t_{ldb} = t_{edb} - \frac{\text{sensible capacity (Btuh)}}{1.10 \times \text{cfm}}$$

$$t_{edb} = \text{Wet-bulb temperature corresponding to enthalpy of air leaving indoor coil (htwb)}$$

$$h_{lwb} = h_{ewb} - \frac{\text{total capacity (Btuh)}}{4.5 \times \text{cfm}}$$

Where: h_{ewb} = Enthalpy of air entering indoor coil

3. The SHC is based on 80 F edb temperature of air entering indoor coil.
Below 80 F edb, subtract (corr factor x cfm) from SHC.
Above 80 F edb, add (corr factor x cfm) to SHC.
Correction Factor = $1.10 \times (1 - BF) \times (edb - 80)$.



HEATING CAPACITIES

48HX030 (2½ TONS)																								
Cfm (Std Air)	Return Air (F db)	Temperature Air Entering Outdoor Coil (F db at 7% rh)																						
			-10		0		10		17		20		30		40		47		50		60		70	
875	60	Cap.	7.8	6.8	12.3	10.1	14.5	13.1	17.1	15.6	18.2	16.4	21.8	19.1	25.7	24.6	28.4	28.4	29.3	29.3	32.1	32.1	35.0	35.0
		kW	2.10		2.13		2.15		2.19		2.20		2.25		2.31		2.36		2.37		2.42		2.47	
	70	Cap.	6.8	5.9	10.1	9.0	13.3	12.1	16.0	14.6	17.1	15.5	21.0	18.4	25.0	24.0	27.9	27.9	28.7	28.7	31.6	31.6	34.5	34.5
		kW	2.25		2.32		2.37		2.40		2.42		2.48		2.57		2.63		2.65		2.72		2.79	
	80	Cap.	3.9	3.3	8.8	7.8	13.8	12.5	17.7	16.1	18.6	16.8	21.9	19.2	25.3	24.2	27.6	27.6	28.4	28.4	31.1	31.1	33.7	33.7
		kW	2.50		2.55		2.60		2.72		2.74		2.82		2.90		2.96		2.98		3.04		3.11	
1000	60	Cap.	9.7	6.7	11.1	9.9	14.0	12.7	16.6	15.2	17.8	16.1	21.9	19.2	25.9	24.8	28.7	28.7	29.6	29.6	32.5	32.5	35.5	35.5
		kW	2.10		2.11		2.15		2.17		2.18		2.23		2.28		2.31		2.32		2.35		2.39	
	70	Cap.	7.0	6.0	9.9	8.8	12.9	11.7	15.4	14.0	16.7	15.0	21.0	18.4	25.2	24.2	28.2	28.2	29.1	29.1	32.1	32.1	35.0	35.0
		kW	2.25		2.30		2.35		2.37		2.39		2.46		2.53		2.58		2.59		2.64		2.69	
	80	Cap.	3.6	3.0	8.8	7.8	14.0	12.6	18.0	16.4	19.0	17.1	22.2	19.5	25.6	24.5	28.0	28.0	28.7	28.7	31.3	31.3	33.8	33.8
		kW	2.50		2.55		2.60		2.72		2.73		2.79		2.85		2.89		2.91		2.95		2.99	
1125	60	Cap.	7.1	6.2	10.8	9.6	14.1	12.1	16.9	15.4	18.1	16.3	22.2	19.4	26.2	25.1	29.0	29.0	29.8	29.8	32.6	32.6	35.3	35.3
		kW	2.10		2.11		2.17		2.19		2.20		2.23		2.27		2.29		2.30		2.31		2.33	
	70	Cap.	6.4	5.5	9.7	8.6	13.0	11.7	15.7	14.3	16.9	15.3	21.2	18.6	25.5	24.4	28.5	28.5	29.3	29.3	32.3	32.3	35.2	35.2
		kW	2.25		2.30		2.35		2.39		2.40		2.45		2.51		2.55		2.56		2.59		2.62	
	80	Cap.	3.9	3.3	9.1	8.1	13.9	12.5	18.3	16.7	19.3	17.4	22.6	19.8	25.9	24.7	28.2	28.2	29.0	29.0	31.5	31.5	34.0	34.0
		kW	2.50		2.55		2.00		2.72		2.74		2.78		2.82		2.86		2.86		2.89		2.92	

48HX036 (3 TONS)																								
Cfm (Std Air)	Return Air (F db)	Temperature Air Entering Outdoor Coil (F db at 7% rh)																						
			-10		0		10		17		20		30		40		47		50		60		70	
1050	60	Cap.	8.8	8.2	12.4	11.4	16.0	14.6	18.5	16.9	20.0	18.0	24.9	21.8	30.6	29.4	34.6	34.6	36.3	36.3	41.8	41.8	47.3	47.3
		kW	2.43		2.47		2.51		2.54		2.56		2.62		2.69		2.73		2.75		2.80		2.86	
	70	Cap.	7.9	7.3	11.5	10.6	15.1	13.8	17.7	16.1	19.1	17.2	24.0	21.0	29.9	28.7	34.0	34.0	35.6	35.6	40.8	40.8	46.0	46.0
		kW	2.60		2.66		2.72		2.76		2.78		2.86		2.94		3.00		3.02		3.07		3.13	
	80	Cap.	6.7	6.2	10.4	9.5	14.1	12.9	16.7	15.2	18.1	16.3	22.9	20.1	28.9	27.8	33.1	33.1	34.7	34.7	39.9	39.9	45.0	45.0
		kW	2.77		2.85		2.93		2.99		3.02		3.10		3.21		3.29		3.31		3.37		3.44	
1200	60	Cap.	8.4	7.9	12.3	11.3	16.1	14.8	18.8	17.2	20.3	18.3	25.3	22.1	31.0	29.8	35.1	35.1	36.8	36.8	42.3	42.3	47.8	47.8
		kW	2.46		2.49		2.53		2.56		2.57		2.62		2.67		2.70		2.71		2.75		2.79	
	70	Cap.	7.5	7.0	11.4	10.5	15.3	14.0	18.0	16.4	19.5	17.6	24.4	21.4	30.3	29.0	34.4	34.4	36.1	36.1	41.9	41.9	47.6	47.6
		kW	2.63		2.68		2.73		2.77		2.79		2.85		2.91		2.96		2.98		3.03		3.08	
	80	Cap.	6.4	6.0	10.3	9.5	14.3	13.0	17.0	15.5	18.5	16.7	23.3	20.5	29.4	28.2	33.6	33.6	35.3	35.3	41.0	41.0	46.6	46.6
		kW	2.81		2.88		2.95		3.00		3.02		3.09		3.18		3.24		3.26		3.32		3.38	
1350	60	Cap.	8.6	8.0	12.5	11.5	16.4	15.0	19.1	17.4	20.6	18.6	25.6	22.4	31.4	30.1	35.5	35.5	37.3	37.3	43.4	43.4	49.4	49.4
		kW	2.50		2.53		2.56		2.58		2.59		2.63		2.66		2.69		2.70		2.74		2.78	
	70	Cap.	7.6	7.1	11.5	10.6	15.5	14.2	18.3	16.7	19.8	17.8	24.7	21.7	30.6	29.4	34.8	34.8	36.5	36.5	42.2	42.2	47.9	47.9
		kW	2.67		2.72		2.76		2.79		2.808		2.85		2.90		2.94		2.95		2.99		3.03	
	80	Cap.	6.3	5.9	10.4	9.6	14.5	13.2	17.3	15.8	18.8	16.9	23.7	20.8	29.8	28.6	34.0	34.0	35.7	35.7	41.3	41.3	46.8	46.8
		kW	2.85		2.91		2.979		3.01		3.03		3.09		3.17		3.22		3.23		3.27		3.32	

LEGEND

Cap. — Heating Capacity (1000 Btu/h) (Includes Indoor-Fan Motor Heat)
db — Dry Bulb
kW — Total Power Input (Includes Compressor Motor Power Input, Outdoor-Fan Motor Input, and Indoor-Fan Motor Input)
rh — Relative Humidity

NOTES:

1. Indicates integrated ratings.
2. Integrated capacity is maximum (instantaneous) capacity less the effect of frost on the outdoor coil and the heat required to defrost it.

Performance data (cont)



HEATING CAPACITIES (cont)

48HX048 (4 TONS)																								
Cfm (Std Air)	Return Air (F db)	Temperature Air Entering Outdoor Coil (F db at 7% rh)																						
			-10		0		10		17		20		30		40		47		50		60		70	
1400	60	Cap.	11.9	11.1	16.3	15.0	20.7	19.0	23.8	21.7	25.6	23.1	31.6	27.7	39.2	37.6	44.5	44.5	46.8	46.8	54.4	54.4	62.1	62.1
		kW	3.05		3.09		3.13		3.16		3.18		3.24		3.33		3.40		3.42		3.51		3.60	
	70	Cap.	11.4	10.6	15.8	14.6	20.3	18.6	23.4	21.4	25.2	22.7	31.0	27.1	38.4	36.8	43.6	43.6	46.0	46.0	53.9	53.9	61.8	61.8
		kW	3.32		3.38		3.44		3.48		3.51		3.58		3.69		3.76		3.80		3.90		4.02	
	80	Cap.	10.6	9.8	15.2	14.0	19.8	18.1	23.0	21.0	24.7	22.3	30.4	26.6	37.7	36.1	42.7	42.7	45.2	45.2	53.3	53.3	61.4	61.4
		kW	3.59		3.68		3.77		3.84		3.86		3.95		4.08		4.16		4.20		4.34		4.47	
1600	60	Cap.	12.0	11.2	16.5	15.2	20.9	19.2	24.1	21.9	25.9	23.3	31.8	27.9	39.5	37.9	44.8	44.8	46.9	46.9	53.7	53.7	60.5	60.5
		kW	3.06		3.09		3.12		3.14		3.15		3.20		3.27		3.33		3.34		3.39		3.44	
	70	Cap.	11.6	10.8	16.0	14.8	20.5	18.7	23.6	21.5	25.4	22.9	31.2	27.4	38.7	37.1	44.0	44.0	46.4	46.4	54.2	54.2	62.1	62.1
		kW	3.33		3.38		3.42		3.45		3.47		3.53		3.62		3.68		3.71		3.79		3.88	
	80	Cap.	10.8	10.0	15.4	14.1	20.0	18.3	23.2	21.1	24.9	22.5	30.6	26.8	38.0	36.4	43.1	43.1	45.6	45.6	53.7	53.7	61.8	61.8
		kW	3.60		3.68		3.75		3.80		3.82		3.90		4.00		4.07		4.10		4.21		4.32	
1800	60	Cap.	12.2	11.3	16.6	15.3	21.1	19.3	24.2	22.1	26.0	23.5	32.1	28.1	39.7	38.1	45.1	45.1	46.9	46.9	53.1	53.1	59.3	59.3
		kW	3.08		3.10		3.12		3.13		3.14		3.17		3.24		3.28		3.29		3.32		3.36	
	70	Cap.	11.7	10.9	16.2	14.9	20.7	18.9	23.8	21.7	25.6	23.0	31.5	27.6	39.0	37.4	44.3	44.3	46.4	46.4	53.4	53.4	60.4	60.4
		kW	3.35		3.38		3.42		3.44		3.46		3.50		3.58		3.63		3.64		3.69		3.75	
	80	Cap.	11.0	10.2	15.6	14.3	20.1	18.4	23.4	21.3	25.1	22.6	30.9	27.0	38.3	36.7	43.5	43.5	45.8	45.8	53.4	53.4	61.0	61.0
		kW	3.62		3.68		3.74		3.78		3.80		3.86		3.95		4.01		4.03		4.10		4.18	

48HX060 (5 TONS)																								
Cfm (Std Air)	Return Air (F db)	Temperature Air Entering Outdoor Coil (F db at 7% rh)																						
			-10		0		10		17		20		30		40		47		50		60		70	
1800	60	Cap.	15.9	14.8	22.0	20.2	28.0	25.6	32.2	29.4	34.5	31.1	41.9	36.7	51.3	49.1	57.8	57.8	61.2	61.2	72.4	72.4	83.6	83.6
		kW	4.20		4.22		4.24		4.26		4.27		4.29		4.36		4.40		4.43		4.53		4.64	
	70	Cap.	13.9	12.9	20.4	18.8	27.0	24.6	31.5	28.7	33.7	30.4	41.1	36.0	50.2	48.1	56.6	56.6	59.8	59.8	70.8	70.8	81.7	81.7
		kW	4.39		4.49		4.60		4.67		4.68		4.72		4.79		4.83		4.87		4.98		5.09	
	80	Cap.	10.8	10.1	18.0	16.6	25.2	23.1	30.3	27.6	32.6	29.4	40.3	35.3	49.2	47.1	55.4	55.4	58.6	58.6	69.2	69.2	79.8	79.8
		kW	4.41		4.65		4.89		5.06		5.09		5.20		5.27		5.32		5.36		5.47		5.58	
2000	60	Cap.	16.2	15.1	22.2	20.5	28.3	25.8	32.5	29.6	34.7	31.3	42.2	37.0	51.6	49.5	58.3	58.3	61.7	61.7	73.1	73.1	84.5	84.5
		kW	4.24		4.24		4.25		4.25		4.26		4.27		4.32		4.35		4.37		4.45		4.53	
	70	Cap.	14.3	13.3	20.8	19.1	27.3	24.9	31.8	29.0	34.0	30.7	41.4	36.3	50.6	48.5	57.0	57.0	60.3	60.3	71.4	71.4	82.5	82.5
		kW	4.45		4.53		4.60		4.66		4.67		4.69		4.74		4.77		4.80		4.88		4.97	
	80	Cap.	11.2	10.5	18.4	17.0	25.6	23.4	30.7	28.0	33.0	29.7	40.6	35.6	49.6	47.5	55.8	55.8	59.0	59.0	69.8	69.8	80.5	80.5
		kW	4.48		4.70		4.91		5.06		5.08		5.15		5.21		5.24		5.27		5.36		5.44	
2250	60	Cap.	16.5	15.4	22.5	20.7	28.5	26.1	32.7	29.9	35.0	31.6	42.5	37.3	52.1	50.0	58.8	58.8	62.3	62.3	73.8	73.8	85.2	85.2
		kW	4.29		4.28		4.27		4.26		4.26		4.26		4.29		4.31		4.33		4.39		4.45	
	70	Cap.	14.7	13.7	21.2	19.5	27.6	25.2	32.1	29.3	34.3	31.0	41.7	36.6	51.0	48.9	57.5	57.5	60.8	60.8	72.1	72.1	83.3	83.3
		kW	4.52		4.57		4.63		4.66		4.66		4.67		4.70		4.72		4.74		4.81		4.87	
	80	Cap.	11.7	10.9	18.9	17.4	26.1	23.8	31.1	28.3	33.4	30.1	41.0	35.9	50.0	47.9	56.3	56.3	59.5	59.5	70.5	70.5	81.4	81.4
		kW	4.57		4.75		4.94		5.07		5.08		5.12		5.16		5.18		5.20		5.26		5.33	

LEGEND

Cap. — Heating Capacity (1000 Btuh) (Includes Indoor-Fan Motor Heat)
db — Dry Bulb
kW — Total Power Input (Includes Compressor Motor Power Input, Outdoor-Fan Motor Input, and Indoor-Fan Motor Input)
rh — Relative Humidity

NOTES:

1. Indicates integrated ratings.
2. Integrated capacity is maximum (instantaneous) capacity less the effect of frost on the outdoor coil and the heat required to defrost it.



DRY-COIL AIR DELIVERY* — HORIZONTAL AND DOWNFLOW DISCHARGE AT 230 AND 460 V; SIZES 030,036
(Deduct 10% from Cfm and Watts for 208 V Operation)

UNIT 48HX	MOTOR SPEED	AIR DELIVERY	EXTERNAL STATIC PRESSURE (in. wg)										
			0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
030	Low	Watts	280	275	265	255	250	245	240	†	†	†	†
		Cfm	820	810	755	700	660	600	560	†	†	†	†
	Med	Watts	365	360	350	345	340	330	320	310	300	†	†
		Cfm	1025	1010	975	940	900	850	800	720	630	†	†
	High	Watts	†	†	490	480	470	460	445	430	410	390	380
		Cfm	†	†	1300	1255	1200	1150	1080	1005	915	790	620
036	Low	Watts	520	495	474	458	445	425	†	†	†	†	†
		Cfm	1375	1335	1290	1240	1200	1140	†	†	†	†	†
	Med	Watts	575	560	535	510	480	460	440	425	†	†	†
		Cfm	1520	1490	1450	1400	1380	1300	1200	1080	†	†	†
	High	Watts	†	†	†	†	650	614	575	540	510	480	†
		Cfm	†	†	†	†	1560	1500	1380	1280	1170	1060	†

*Air delivery values are without air filter and are for dry coil. See Wet Coil Pressure Drop table, page 16. Deduct field-supplied air filter pressure drop and wet coil pressure drop to obtain external static pressure available for ducting.

†Unit air delivery is outside of operating range.

NOTE: Do not operate the unit at a cooling airflow that is less than 350 cfm for each 12,000 Btuh of rated cooling capacity. Indoor-coil icing may occur at airflows below this point. Water blow-off may occur at airflows above 450 cfm per 12,000 Btuh of rated cooling capacity.

DRY COIL AIR DELIVERY* — GAS HEATING;
SIZES 048,060

HORIZONTAL AND DOWNFLOW DISCHARGE FOR
INTEGRATED CONTROL MOTOR UNITS AT 230-V
(Deduct 10% from Cfm for 208-V Operation)

HEATING INPUT (Btuh)	EASY SELECT BOARD TERMINALS AIRFLOW (Cfm)			
	1	2	3	4
80,000	1300	1400	1600	1750
100,000	—	1400	1600	1750

*Air delivery values are for dry coil at 230 v. Airflow is independent of external static pressure within $\pm 5\%$ of table values up to 0.8 in. wg.

NOTES:

1. Dashed area does not fall within approved range.
2. The above values occur with the AC/HP CFM ADJUST select jumper on the Easy Select interface board set on MED.
3. Airflow can be adjusted +10% or -10% by selecting HI or LO for all modes except FAN ONLY.

DRY COIL AIR DELIVERY* — FAN ONLY; SIZES 048,060

HORIZONTAL AND DOWNFLOW DISCHARGE FOR
INTEGRATED CONTROL MOTOR UNITS AT 230-V
(Deduct 10% from Cfm for 208-V Operation)

UNIT 48HX	FAN ONLY (Cfm)
048	1400
060	1750

*Air delivery values are for dry coil at 230 v. Airflow is independent of external static pressure within $\pm 5\%$ of table values up to 0.8 in. wg.

DRY COIL AIR DELIVERY* — COOLING AND HEAT
PUMP HEATING; SIZES 048,060

HORIZONTAL AND VERTICAL DISCHARGE FOR
INTEGRATED CONTROL MOTOR UNITS AT 230-V
(Deduct 10% from Cfm for 208-V Operation)

UNIT SIZE	EASY SELECT BOARD TERMINALS			
	1	2	3	4
	Airflow (Cfm)			
048,060 Cooling Mode	1260	1440	1575	1800
048 Heating Mode				
060 Heating Mode	1400	1600	1750	2000

*Air delivery values are for dry coil at 230 v. Airflow is independent of external static pressure within $\pm 5\%$ of table values up to 0.8 in. wg.

NOTE: Do not operate the unit at a cooling airflow that is less than 350 cfm for each 12,000 Btuh of rated cooling capacity. Indoor-coil icing may occur at airflows below this point. Water blow-off may occur at airflows above 450 cfm per 12,000 Btuh of rated cooling capacity.

Performance data (cont)



WET COIL PRESSURE DROP

UNIT SIZE	AIRFLOW (cfm)	PRESSURE DROP (in. wg)
030	800	0.025
	900	0.039
	1000	0.057
	1200	0.072
036	1000	0.068
	1200	0.096
	1400	0.116
	1600	0.136
048	1400	0.068
	1600	0.075
	1800	0.088
060	1700	0.082
	1900	0.095
	2100	0.108
	2300	0.123

FILTER PRESSURE DROP (in. wg)

UNIT 48HX	FILTER SIZE (in.)	CFM																
		700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300
030,036	24 x 24	.06	.06	.07	.07	.08	.09	.10	.12	.13	—	—	—	—	—	—	—	—
048,060	24 x 30	—	—	—	—	—	—	.08	.09	.09	.10	.11	.12	.13	.14	.15	.17	.18

Application data

Condensate trap — A 2-in. condensate trap must be field supplied.

Ductwork — Secure downflow discharge ductwork to roof curb. For horizontal discharge applications, attach ductwork to unit with flanges.

To convert a unit to downflow discharge or horizontal discharge — Units are equipped with factory-installed duct covers on both the vertical and horizontal openings. Remove appropriate duct panel covers for intended discharge application. Units utilizing downflow configuration option do not require duct panel cover removal.

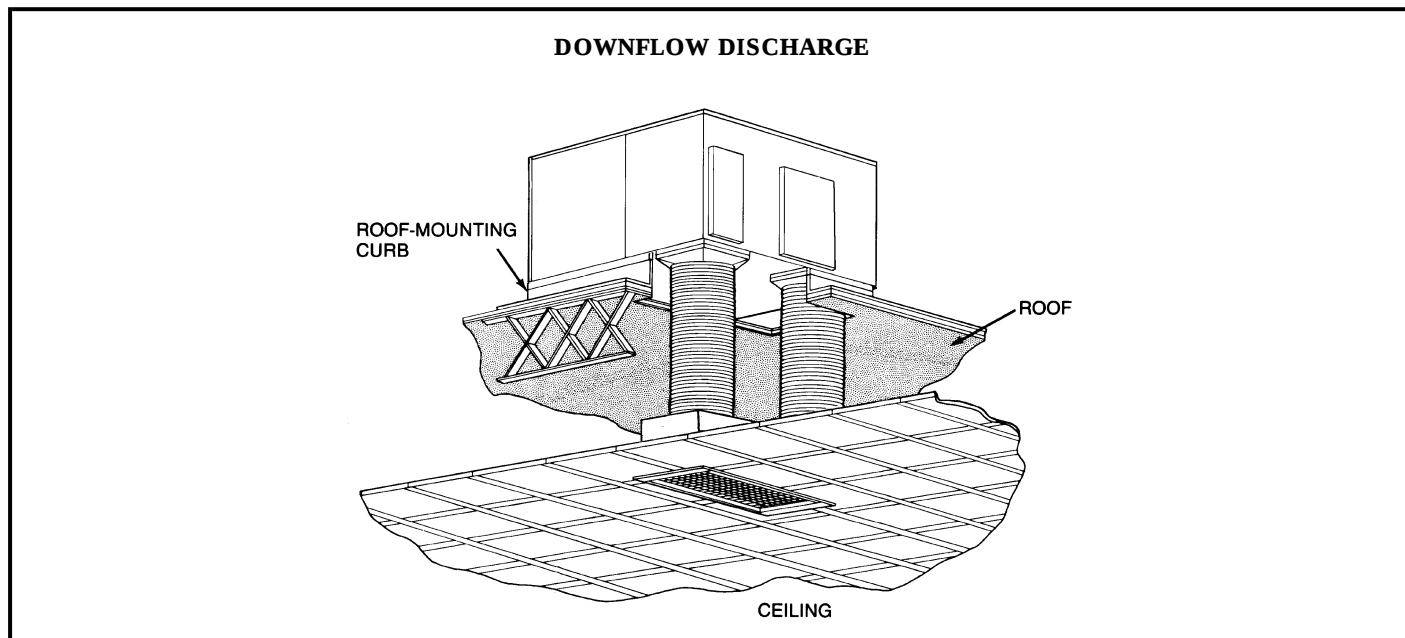
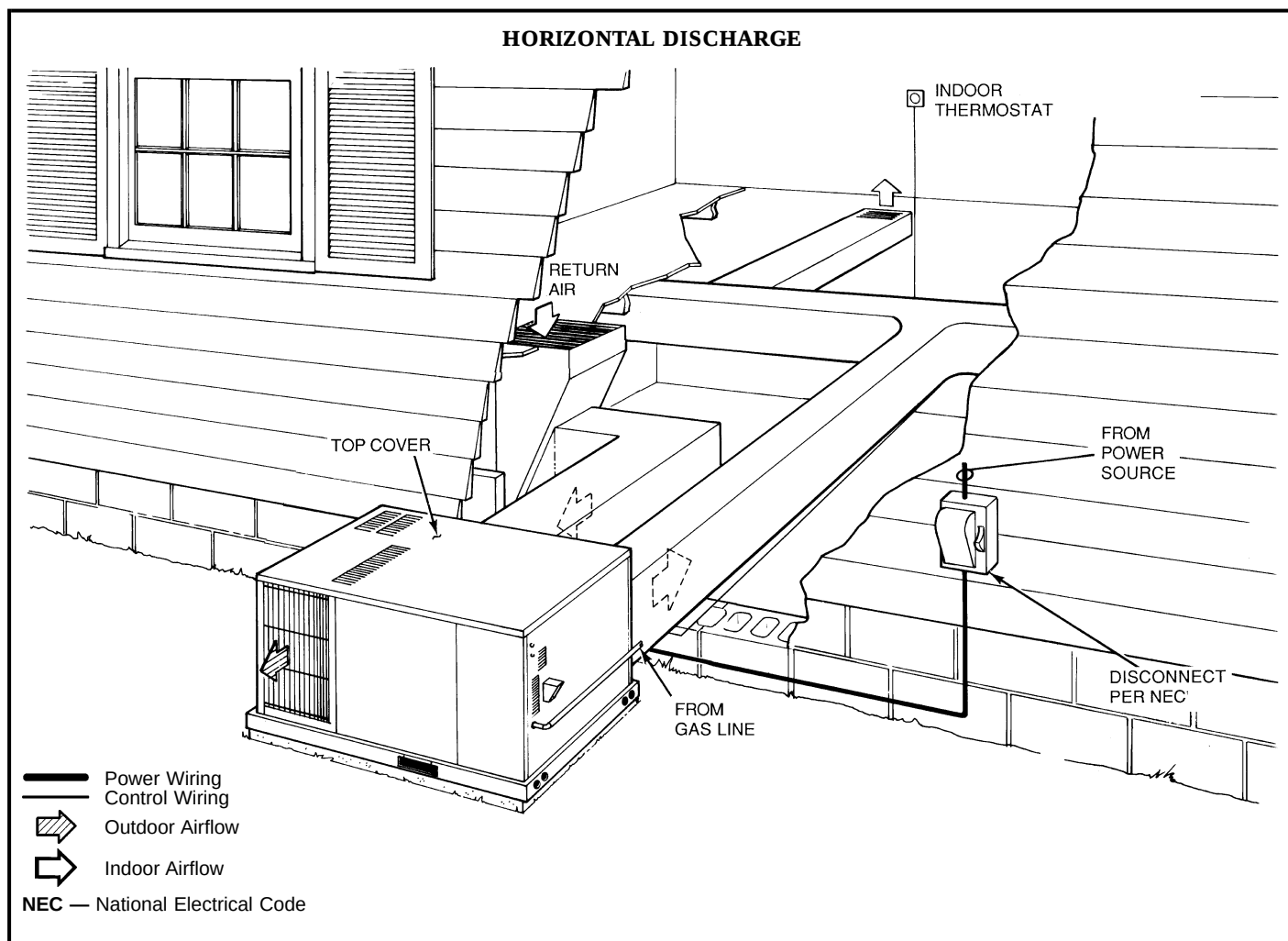
Thermostat — A standard heat pump thermostat with one stage cooling and 2-stage heating is recommended for all units.

Airflow — Units are draw-thru on cooling and blow-thru on heating.

Maximum cooling airflow — To minimize the possibility of condensate blow-off from indoor fan, airflow through units should not exceed 450 cfm/ton.

Minimum cooling airflow is 350 cfm/ton.

Minimum ambient operating temperature in cooling for all standard units is 40 F. With accessory low ambient temperature kit, units can operate at temperatures down to 0° F.



UNIT SIZE	V-PH-Hz	VOLTAGE RANGE		COMPRESSOR		OUTDOOR-FAN MOTOR	INDOOR-FAN MOTOR	POWER SUPPLY		AWG 60 C MIN WIRE SIZE	MAX WIRE LENGTH (ft)
		Min	Max	RLA	LRA	FLA	FLA	MCA	MOCP*		
030	208/230-1-60	187	253	15.0	73	1.4	2.6	22.8	30	10	100
	208/230-3-60	187	253	10.1	63	1.4	2.8	16.6	25	12	75
036	208/230-1-60	187	253	17.2	88	1.4	2.8	25.7	40	10	90
	208/230-3-60	187	253	11.4	77	1.4	2.8	18.5	25	12	65
	460-3-60	414	506	5.7	39	0.8	1.4	9.3	15	14	100
048	208/230-1-60	187	253	26.4	129	1.4	7.2	41.6	60	6	100
	208/230-3-60	187	253	15.0	99	1.4	7.2	27.4	40	10	70
060	208/230-1-60	187	253	32.1	169	2.1	7.2	49.4	60	6	100
	208/230-3-60	187	253	19.3	123	2.1	7.2	33.4	50	8	100

LEGEND

AWG — American Wire Gage
FLA — Full Load Amps
HACR — Heating, Air Conditioning and Refrigeration
LRA — Locked Rotor Amps
MCA — Minimum Circuit Amps
MOCP — Maximum Overcurrent Protection
RLA — Rated Load Amps

*Fuse or HACR breaker.

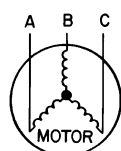
NOTES:

- In compliance with NEC (National Electrical Code) requirements for multimotor and combination load equipment (refer to NEC Articles 430 and 440), the overcurrent protective device for the unit shall be fuse or HACR breaker. The CUL (Canadian Underwriters' Laboratories) units may be fuse or circuit breaker.
- Minimum wire size is based on 60 C copper wire. If other than 60 C wire is used, or if length exceeds wire length in table, determine size from NEC.
- Unbalanced 3-Phase Supply Voltage**
Never operate a motor where a phase imbalance in supply voltage is greater than 2%. Use the following formula to determine the percent of voltage imbalance.

% Voltage imbalance

$$= 100 \times \frac{\text{max voltage deviation from average voltage}}{\text{average voltage}}$$

Example: Supply voltage is 460-3-60.



AB = 452 v
 BC = 464 v
 AC = 455 v

$$\text{Average Voltage} = \frac{452 + 464 + 455}{3}$$

$$= \frac{1371}{3}$$

$$= 457$$

Determine maximum deviation from average voltage.

(AB) 457 - 452 = 5 v

(BC) 464 - 457 = 7 v

(AC) 457 - 455 = 2 v

Maximum deviation is 7 v.

Determine percent of voltage imbalance.

$$\% \text{ Voltage Imbalance} = 100 \times \frac{7}{457}$$

$$= 1.53\%$$

This amount of phase imbalance is satisfactory as it is below the maximum allowable 2%.

IMPORTANT: If the supply voltage phase imbalance is more than 2%, contact your local electric utility company immediately.



Sequence of operation

Heating Sequence of Operation — On a call for heat, one of 2 Heating modes occurs, depending on the field setting of the economic balance point (EBP).

The first Heating mode occurs when the outdoor temperature is warmer than the EBP. On a call for heat, the thermostat makes circuits R-Y and R-G. When compressor time delay (5 ± 2 minutes) is completed, a circuit is made to C, starting compressor (COMP) and outdoor-fan motor (OFM). Circuit R-G also is completed, energizing indoor-fan relay (IFR) and starting indoor-fan motor (IFM) after a 1-second delay. Should room temperature continue to fall, circuit R-W is made through second-stage thermostat bulb. One relay opens, turning off the compressor, and another relay is energized signaling the integrated gas control (IGC) board to bring on the gas heat. When the thermostat is satisfied, contacts open, deenergizing contactor and relay; motors and gas heater deenergize. The IFM may be controlled by a time-delay relay that keeps the fan on for 30 seconds.

The second Heating mode occurs when the outdoor temperature is colder than the EBP. On a call for heat, the thermostat energizes the gas heat relay, signaling the IGC board to bring on the gas heat. In this Heating mode, both first- and second-stage heat is gas heating. When thermostat is satisfied, contacts open, deenergizing contactor and relay; motors and gas heater deenergize. The IFM may be controlled by a time-delay relay that keeps the fan on for 30 seconds.

Cooling Sequence of Operation — When the room temperature rises to a point that is slightly above the cooling control setting of the thermostat, the thermostat completes the circuit between thermostat terminal R to terminals Y and G. These completed circuits through the thermostat

connect contactor coil (C) (through unit wire Y) and blower relay coil (BR) (through unit wire G) across the 24-v secondary of transformer (TRAN).

NOTE: The blower relay coil (BR) is used on non-ICM units; ICM units use indoor fan on (IFO) connection.

The normally-open contacts of energized contactor (C) close and complete the circuit through compressor motor (COMP) to OFM. Both motors start instantly.

On non-ICM units, the set of normally-open contacts of energized relay BR closes and completes the circuit through IFM. On ICM units, the IFO completes the circuit through blower IFM. The IFM starts instantly.

NOTE: Once the compressor has started and then has stopped, it should not be started again until 5 minutes have elapsed.

The cooling cycle remains on until the room temperature drops to point that is slightly below the cooling control setting of the room thermostat. At this point, the thermostat breaks the circuit between thermostat terminal R to terminals Y and G. These open circuits deenergize contactor coil C and relay coil BR. The OFM and compressor motor stop. After a 30-second delay, the IFM stops. The unit is in a standby condition, waiting for the next call for cooling from the room thermostat.

Defrost — Defrost board (DB) is a time and temperature control, which includes a field-selectable time period between checks for defrost (30, 50, and 90 minutes). Electronic timer and defrost cycle start only when contactor is energized and defrost thermostat (DFT) is closed.

Defrost mode is identical to Cooling mode, except outdoor-fan motor stops and gas heat turns on to warm air supplying the conditioned space.

LEGEND AND NOTES FOR TYPICAL WIRING SCHEMATIC

LEGEND

AWG — American Wire Gage
BD — Board
BR — Blower Relay
C — Contactor, Compressor
CAP — Capacitor
COMP — Compressor Motor
CR — Combustion Relay
CTD — Compressor Time Delay
DB — Defrost Board
DFT — Defrost Thermostat
DR — Defrost Relay
DT — Discharge Thermostat
EQUIP — Equipment
FL — Fuse Link
FS — Flame Sensor
FU — Fuse
GND — Ground
GVR — Gas Valve Relay
HR — Heater Relay
HS — Hall Effect Sensor

HV TRAN — High-Voltage Transformer
ICM — Integrated Control Motor
IDM — Induced Draft Motor
IFM — Indoor-Fan Motor
IGC — Integrated Gas Control
IP — Internal Protector
LR — Lockout Relay
LS — Limit Switch
MGV — Main Gas Valve
NEC — National Electrical Code
OAT — Outdoor-Air Thermostat
OF — Outdoor Fan
OFM — Outdoor-Fan Motor
PL — Plug
PWR — Power
QT — Quadruple Terminal
RS — Rollout Switch
RVS — Reversing Valve Solenoid
SUPL — Supplementary
TRAN — Transformer
TSTAT — Thermostat

 Field Splice
 Terminal (Marked)
 Terminal (Unmarked)
 Terminal Block
 Splice
 Factory Wiring
 Field Control Wiring
 Field Power Wiring
 To Indicate Common Potential Only, Not to Represent Wiring

NOTES:

1. If any of the original wire furnished must be replaced, it must be replaced with type 90 C wire or its equivalent.
2. Use thermostat: HH07AT171, with subbase HH93AZ188.
3. Set heat anticipator at 0.6.
4. Use copper conductors only.



Packaged Dual Fuel Heat Pump Constant Volume Application

HVAC Guide Specifications

Size Range: **2½ to 5 Tons, Nominal Cooling
40,000 to 95,000 Btuh,
Nominal Heating Input**

Carrier Model Number: **48HX**

Part 1 — General

1.01 SYSTEM DESCRIPTION

Outdoor package, electrically controlled air-to-air heat pump with gas-fired back-up heat, utilizing a scroll compressor for heating and cooling duty. Unit shall discharge supply air horizontally or vertically as shown on contract drawings.

1.02 QUALITY ASSURANCE

- A. Unit shall be rated in accordance with ARI Standards 210/240-89 and 270-84.
- B. Unit shall be designed in accordance with UL Standard 564 and to conform to ASHRAE 15.
- C. Unit shall be UL and CUL listed as a total package for safety requirements.
- D. Roof curb shall be designed to conform to NRCA Standards.
- E. Insulation and adhesive shall meet NFPA 90A requirements for flame spread and smoke generation.
- F. Unit shall be manufactured in a facility registered to the ISO 9002 (International Standards Organization) manufacturing quality standard.

1.03 DELIVERY, STORAGE, AND HANDLING

- A. Unit shall be stored and handled per manufacturer's recommendations.

Part 2 — Products

2.01 EQUIPMENT

A. General:

Factory-assembled, single-piece air-to-air dual fuel heat pump. Contained within the enclosure shall be all factory wiring, piping, controls, refrigerant charge (R-22), and special features required prior to field start-up.

B. Unit Cabinet:

1. Unit cabinet shall be constructed of phosphated, zinc-coated, prepainted steel, capable of withstanding 500 hours in salt spray.
2. Cabinet panels shall be easily removed for servicing.
3. Indoor fan compartment interior cabinet surfaces shall be insulated with a minimum ½-in. thick, flexible fiberglass insulation, coated on the air side. Aluminum foil-faced fiberglass insulation shall be used in the entire section.
4. Unit shall have a field-supplied condensate trap.
5. Unit insulation shall conform to ASHRAE 62P.

C. Fans:

1. The indoor fan shall be 3-speed (size 030), 2- or 3-speed (size 036), or variable speed (sizes 048,060), direct-drive, as shown on equipment drawings.

2. Fan wheel shall be made from steel, be double-inlet type with forward curved blades with corrosion resistant finish and shall be dynamically balanced.
3. Outdoor fan shall be of the direct driven, propeller type with aluminum blades riveted to corrosion resistant steel spiders, be dynamically balanced, and discharge air vertically upwards and horizontally.

D. Compressor:

1. Fully hermetic compressor with factory-installed vibration isolation.
2. Scroll compressors shall be standard on all units.

E. Coils:

Indoor and outdoor coils shall have aluminum plate fins mechanically bonded to seamless copper tubes with all joints brazed. Tube sheet openings shall be belled to prevent tube wear.

F. Heating Section:

1. Induced-draft combustion type with energy saving direct spark ignition system and redundant main gas valve.
2. Induced-draft motors shall be provided with solid-state hall effects sensor to ensure adequate airflow for combustion.
3. The heat exchangers shall be constructed of aluminized steel for corrosion resistance.
4. Burners shall be of the in-shot type, constructed of aluminum-coated steel.
5. All gas piping and electric power shall enter the unit cabinet at a single location.

G. Refrigerant Components:

Refrigerant components shall be of the Acutrol™ feed system type.

H. Filter section shall consist of field-installed, throw-away, 1-in. thick fiberglass filters of commercially available sizes.

I. Controls and Safeties:

1. Unit Controls:

- a. Unit shall be complete with self-contained low-voltage control circuit.
- b. Unit shall incorporate an outdoor-coil defrost system to prevent excessive frost accumulation during heating duty, and shall be controlled as follows:
 - 1) Defrost shall be initiated on the basis of time and coil temperature.
 - 2) A 30/50/90 minute timer shall activate defrost cycle only if coil temperature is low enough to indicate a heavy frost condition.
 - 3) Defrost cycle shall terminate when defrost thermostat is satisfied or shall have a positive termination time of 10 minutes.

2. Safeties:
Compressor, overtemperature, overcurrent, and loss-of-charge.
- J. Operating Characteristics:
 1. Unit shall be capable of starting and running at 115 F ambient outdoor temperature per maximum load criteria of ARI Standard 240-89.
 2. Compressor with standard controls shall be capable of operation down to 40 F ambient outdoor temperature in cooling duty.
 3. Compressor shall be capable of operation in heating duty down to -20 F ambient outdoor-air temperature.
 4. Unit shall be capable of simultaneous heating duty and defrost cycle operation.
 5. Compressors will be prevented from restarting for a minimum of 5 minutes after shutdown.
 6. Unit shall be provided with fan time delay in gas heat mode to prevent cold air delivery before heat exchanger warms up.
 7. Unit shall be provided with 30-second fan time-delay after the thermostat is satisfied.
- K. Electrical Requirements:
All unit power wiring shall enter unit cabinet at a single location.
- L. Motors:
 1. Compressor motors shall be of the refrigerant-cooled type with line break thermal and current overload protection.
 2. All fan motors shall have permanently lubricated-bearings, and inherent automatic reset thermal overload protection.
 3. Outdoor-fan motor shall be totally enclosed.
- M. Special Features:
 1. Roof Curb:
Curb shall have seal strip and a wood nailer for flashing and shall be installed per manufacturer's instructions.
 2. Manual Outdoor-Air Damper:
Manual damper package shall consist of damper, birdscreen, and rainhood which can be preset to admit outdoor air for year-round ventilation.
 3. Thermostat and Subbase:
To provide for 2-stage heating and one-stage cooling in addition to manual or automatic change-over and fan control.
 4. Natural Gas-to-Propane Conversion Kit:
Kit shall be complete with regulator spring, burner orifice, and pilot orifice.
 5. Low Ambient Kit:
Package shall consist of a solid-state control and condenser coil temperature sensor for controlling outdoor-fan motor operation. Accessory shall allow unit to operate down to 0° F outdoor ambient temperature.
 6. Lifting Bracket Kit:
Kit shall provide attachment points for rigging straps.
 7. Filter Rack:
Filter rack shall provide filter mounting for down-flow applications.
 8. Downshot-to-Sideshot Conversion Kit:
Kit shall enable conversion of a dedicated down-shot discharge unit to horizontal discharge unit.
 9. Base Rail:
Provides holes for rigging and handling as well as an elevated base for horizontal applications.
 10. Downflow Option:
Provides for easy vertical ductwork connections.

